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(54) RESIN COMPOSITE MATERIAL

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a resin composite material excellent in mechanical properties and excellent in impact resistance and moldability as well by including a specific resin, a rubber and/or thermoplastic elastomer, and organized clay dispersed in the resin.

SOLUTION: This resin composite material is obtained by including (A) a polar thermoplastic resin, (B) a rubber and/or thermoplastic elastomer, and (C) organized clay, i.e., clay (clay mineral) organized with an organizing agent, so that the component C is dispersed in the component A; wherein the component A is pref. a polyphenylene ether-based resin, the polyphenylene ether-based resin compatibilized with a thermoplastic resin, or the like, containing pref. ≤32 mol% of polar groups. This composite material is in such a morphology that the component B is interspersed island-fashion in a matrix of the component A and the component C is dispersed in the component A, or the component A dispersed with the component C is interspersed island-fashion in a matrix of the component B.

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CLAIMS

[Claim(s)]
[Claim 1] It is the resin composite material which is the resin composite material which consists of polar thermoplastics, rubber and/or thermoplastic elastomer, and organic-ized clay, and is characterized by the above-mentioned organic-ized clay being in the condition of having distributed in the above-mentioned thermoplastics.
[Claim 2] The thermoplastics which has the above-mentioned polarity in claim 1 is a resin composite material characterized by being the resin of a polyphenylene ether system, or the resin of a polyphenylene ether system and the thermoplastics which was compatible in this.
[Claim 3] It is the resin composite material which the above-mentioned rubber and the above-mentioned thermoplastic elastomer come to contain a polar group, and is further characterized by the content of the above-mentioned polar group being less than [32mol%] in the above-mentioned rubber and the above-mentioned thermoplastic elastomer in claim 1 or 2.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the resin composite material which consists of thermoplastics, rubber and/or thermoplastic elastomer, and organic-ized clay.
[0002]
[Description of the Prior Art] Before, in order to improve the mechanical property of polymeric materials, and the barrier property to matter transparency, the composite material which added organic-ized clay is examined. For example, adding organic-ized clay to thermosetting macromolecules, such as nylon, a vinyl system macromolecule, and epoxy, or rubber is known (5 JP,62-74957,A, JP,1-198645,A, E.P.Giannelis et al. Chem.Mater. 1694 -1696 (1993) etc.).
[0003] After these make clay organic by organic onium ion, they can be obtained by the approach of making the polymerization of a monomer starting between layers, the approach of including clay in a growth kind, or the method of kneading clay with a macromolecule and putting in a macromolecule between the layers of clay. In addition, it is the matter which has the layer structure which clay (clay mineral) is a silicate mineral with the layer structure etc. so that it may mention later, and consisted of that many sheets carried out a laminating here. Between the above-mentioned layers, it is a gap between each sheet.
[0004] By the way, in order to improve the shock resistance of thermoplastics, generally adding rubber and/or thermoplastic elastomer is performed. The functional group which has the compatibility over thermoplastics as the above-mentioned rubber and thermoplastic elastomer in this case is combined, or that to which copolymerization of the monomer containing a functional group with the compatibility over thermoplastics was carried out is used.
[0005] And it was proposed that organic-ized clay tends to be added to the above-mentioned thermoplastics excellent in the shock resistance obtained by doing in this way, and it is going to obtain the ingredient which was excellent in the mechanical property with shock resistance. In this ingredient, it distributed also to the rubber and/or thermoplastic elastomer which were added in order to improve shock resistance with thermoplastics, and organic-ized clay restrained the molecule which constitutes each, and was raising the mechanical strength of an ingredient.
[0006]
[Problem(s) to be Solved] However, with conventional thermoplastics excellent in shock resistance, shock-proof improvement is achieved because the part which the added rubber and thermoplastic elastomer occupy gives flexibility to the whole resin.
[0007] And when the parts of rubber or thermoplastic elastomer became hard by distribution of organic-ized clay, in order that the flexibility of resin might decrease, there was a problem that shock resistance fell. Moreover, since the viscosity in the condition that resin became soft became high by constraint of the molecule by clay distribution, the problem that shaping was difficult had also been produced. The ingredient which has a high mechanical property, shock resistance, and the outstanding moldability with an ingredient conventionally was not found. many [if it is the ingredient equipped with all with these

mechanical properties, shock resistance, and moldabilities, since it can use in the field of the container which dedicates the package of the inboard and outboard panel of an automobile, an engine bay internal, and electronic equipment, an oil, etc. for example] -- it is alike and useful on industry.
[0008] This invention was made in view of this conventional trouble, and tends to offer the resin composite material which is excellent also about shock resistance or a moldability with a mechanical property.
[0009]
[Means for Solving the Problem] Invention according to claim 1 is a resin composite material which consists of polar thermoplastics, rubber and/or thermoplastic elastomer, and organic-ized clay, and the above-mentioned organic-ized clay is in the resin composite material characterized by being in the condition of having distributed in the above-mentioned thermoplastics.
[0010] "The polar thermoplastics" in this invention has functional groups, such as association of ether linkage, amino association, amide association, an ester bond, urea association, a urethane bond, sulfide association, etc., an aromatic series ring and a hydroxyl group, a thiol group, a thioether radical, an epoxy group, a carboxylic-acid radical, a sulfone radical, a halogen radical, an acid-anhydride radical, and a nitrile group, in resin.
[0011] Although a polystyrene and styrene-butadiene copolymer, styrene-hydrogenation polybutadiene, a polycarbonate, polyacetal, polyester, polysulfide, polyether sulphone, a polyether ketone, and acrylic resin are specifically mentioned, since it is easy to distribute the organic-ized clay which compatibility with organic-ized clay turns to with a molecular level, especially polyamide system resin, poly para-phenylene system resin, and these alloy system resin are more desirable.
[0012] Moreover, the "rubber" in this invention and "thermoplastic elastomer" have functional groups, such as polar resin, the aromatic series ring which can raise compatibility and a hydroxyl group, a thiol group, a thioether radical, an epoxy group, a carboxylic-acid radical, a sulfone radical, a halogen radical, a maleic-acid radical, and a nitrile group. As these examples, styrene system elastomers, such as maleic-acid denaturation ethylene-propylene-diene rubber, maleic-acid denaturation polybutadiene rubber, maleic-acid denaturation rubber, a polystyrene-polybutadiene block copolymer, a polystyrene-hydrogenation polybutadiene block copolymer, and a polystyrene-Pori (ethylene-propylene) block copolymer, etc. are mentioned.
[0013] The above-mentioned organic-ized clay makes clay (clay mineral) organic in an organic-ized agent. It is the matter which has the layer structure which clay (clay mineral) is a silicate mineral with the layer structure etc., and consisted of that many sheets carried out a laminating here. It is the tetrahedron sheet which the tetrahedron which consisted of silicic acid combined a majority of some things in the direction of a flat surface, and was formed in the above-mentioned sheet, and a certain thing is the octahedron sheet with which much octahedrons containing aluminum, Mg, etc. joined together, and were formed in the direction of a flat surface. The class of element which constitutes the layer structure and the sheet by this sheet etc. varies with each clay.
[0014] As such clay, a montmorillonite, saponite, hectorite, beidellite, a stevensite, nontronite, a vermiculite, halloysite, a mica, a fluorination mica, a kaolinite, a pie ROFIRO light, etc. are mentioned, for example. Moreover, a natural product or a compost is sufficient. Moreover, various onium ion etc. can be used as the above-mentioned organic-ized agent.
[0015] These various onium ion is the ammonium ion of the 1-4th class, for example, can use hexyl ammonium ion, octyl ammonium ion, 2-ethylhexyl ammonium ion, dodecyl ammonium ion, lauryl ammonium ion, octadecyl ammonium ion, dioctyl dimethyl ammonium ion, trioctyl ammonium ion, dioctadecyl dimethyl ammonium ion, trioctyl ammonium ion, dioctadecyl dimethyl ammonium ion, trio KUTADE sill ammonium ion, etc.
[0016] Moreover, HOSUFONIUMU ion can be used. As HOSUFONIUMU ion, tetraethyl HOSUFONIUMU ion, triethyl benzyl HOSUFONIUMU ion, tetra--n-butyl HOSUFONIUMU ion, tree n-butyl hexadecyl HOSUFONIUMU ion, tree n-butyl benzyl HOSUFONIUMU ion, etc. can be used.
[0017] Moreover, the resin composite material of this invention has the ingredient which consists of others, thermoplastics, rubber and thermoplastic elastomer, and organic-ized clay. [ingredient / which

consists of thermoplastics, rubber, the ingredient that consists of organic-ized clay thermoplastics, thermoplastic elastomer, and organic-ized clay]
[0018] and As a composite material concerning this invention As opposed to the base material which consists of ** and (1) thermoplastics in the shape of an island Rubber And/ Or the thing in the condition of it having been dotted with thermoplastic elastomer and having been dotted with the thermoplastics which organic-ized clay distributed in the shape of an island to the thing in the condition that organic-ized clay distributed to the thermoplastics which is a base material, and the base material which consists of (2) rubber and/or thermoplastic elastomer reversely [the], Or the thing in the condition of having lived together is mentioned, (3) both constituting another phase mutually.
[0019] Moreover, although it is that all organic-ized clay distributes the most desirable one to a thermoplastics side although it is in the distributed condition of organic-ized clay, even if a certain amount of quantity of organic-ized clay distributes to rubber and/or thermoplastic elastomer, the effectiveness concerning this invention can be acquired. If organic-ized clay is below 1 weight section, since the effectiveness concerning this invention can specifically be acquired to rubber and/or the thermoplastic-elastomer 100 weight section, it is desirable.
[0020] Next, it explains per operation of this invention. In this invention, organic-ized clay is distributing to thermoplastics. By the way, the following conditions are pointed out as organic-ized clay distributes to thermoplastics. Although organic-ized clay has the layer structure which consisted of that many sheets carried out a laminating, this sheet comes apart and it distributes to thermoplastics, each sheet has played the role which restrains the molecule of thermoplastics at this time. Therefore, the resin composite material concerning this invention turns into an ingredient excellent in mechanical properties, such as high tensile strength and a high modulus of elasticity in tension, (refer to the example of an operation gestalt).
[0021] And it is distributing to thermoplastics and the above-mentioned clay is distributed neither to rubber nor thermoplastic elastomer. Therefore, flexibility and resiliency will be given to the resin composite material concerning this invention focusing on a rubber and thermoplastic elastomer's existence part, and it turns into an ingredient excellent in shock resistance. Moreover, since the parts of the above-mentioned rubber or thermoplastic elastomer give a fluidity to resin composite material when resin composite material becomes soft with heating etc., at the time of shaping, resin can spread to all the corners of a mold. Therefore, it is the ingredient excellent in the moldability.
[0022] As mentioned above, according to this invention, the resin composite material which is excellent also about shock resistance or a moldability with a mechanical property can be offered.
[0023] Moreover, in order that the clay distributed in thermoplastics may check matter transparency, the resin composite material concerning this invention is excellent also in barrier property. Thereby, the resin composite concerning this invention can be used for the film for food packing with the need of intercepting gases, such as various fuel tanks for automobiles, various fuel hose, a refrigerant hose for air-conditioners, a radiator tank, and oxygen, etc.
[0024] Although it is the presentation of the resin composite material concerning this invention, and especially the content of the content of thermoplastics and rubber, and/or thermoplastic elastomer is not restricted, as for the content of organic-ized clay, it is desirable that it is 0.01 - 20wt% to thermoplastics. When it compound-izes exceeding 20wt(s)%, a possibility that organic-ized clay may distribute is in a rubber [other than thermoplastics], and/or thermoplastic-elastomer side. Moreover, there is a possibility that effectiveness sufficient less than [0.01wt%] may not be acquired.
[0025] Furthermore, as for the content of the organic-ized clay to thermoplastics, it is more desirable that it is 0.1wt% - 10wt%. 0. Less than [1wt%], although reinforcement, rigidity, etc. improve, there is a possibility that barrier property may not improve. If 10wt(s)% is exceeded, it will embrittle too much, and there is a possibility that shock resistance may not be improvable with rubber and/or thermoplastic elastomer.
[0026] As for the above-mentioned polar thermoplastics, in invention of claim 2, it is desirable that they are the resin of a polyphenylene ether system, or the resin of a polyphenylene ether system and the thermoplastics which was compatible in this. Compatibility with the above-mentioned resin is high, it is

easy to distribute organic-ized clay with a molecular level, and organic-ized clay can raise reinforcement and rigidity greatly by little addition.
[0027] Moreover, although the Pori (2, 6-dimethyl -1, 4-phenylene) ether is mentioned as typical polyphenylene ether system resin as an example of "the resin of a polyphenylene ether system, and the thermoplastics which was compatible in this", phenols and the resin which specifically copolymerized a phenol, o-cresol, 2, 5-xylenol, 2 and 3, and 6-trimethyl phenols can also be used by the resin which made this main structure. Moreover, two or more kinds of polyphenylene ether resin can be used also as mixture.
[0028] Although polystyrene is mentioned to the thermoplastics which is compatible in these as typical thermoplastics, the resin which copolymerized methyl styrene, ethyl styrene, and t-butyl styrene can also be used by the resin which made this main structure. In the combination of this, the most general things are the Pori (2, 6-dimethyl -1, 4-phenylene) ether and polystyrene.
[0029] Next, like invention of claim 3, the above-mentioned rubber and the above-mentioned thermoplastic elastomer come to contain a polar group, and, as for the content of the above-mentioned polar group, it is still more desirable in the above-mentioned rubber and the above-mentioned thermoplastic elastomer that it is less than [32mol%]. While being able to strengthen more association between rubber, thermoplastic elastomer, and polar thermoplastics by this, distribution of the organic-ized clay to rubber or thermoplastic elastomer can be prevented. In addition, although the above-mentioned elastomer "the above-mentioned content of the above-mentioned polar group is less than [32mol%] in the above-mentioned rubber and the above-mentioned thermoplastic elastomer" is a copolymer, it is the semantics that the rate as a monomer which the polar group contains is less than [32mol%] as the copolymerization presentation ratio.
[0030] When 32-mol% is exceeded, organic-ized clay distributes to rubber or thermoplastic elastomer, rubber and thermoplastic elastomer are stiffened, and there is a possibility of reducing the shock resistance of resin composite material. Moreover, there is a possibility of the fluidity of the resin composite material at the time of heating falling, and reducing a moldability.
[0031] Moreover, restricting to less than [15mol%] is more desirable. Thereby more certainly, to rubber or thermoplastic elastomer, organic-ized clay can be prevented from almost distributing, and almost all organic-ized clay can distribute to thermoplastics. Furthermore, the weatherability of resin composite material is maintainable. When 15-mol% is exceeded, there is a possibility that weatherability may fall depending on the class of polar group to contain.
[0032] Furthermore, considering as less than [2.5mol%] is desirable preferably. Thereby still more certainly, to rubber or thermoplastic elastomer, organic-ized clay can be prevented from almost distributing, and almost all organic-ized clay can distribute to thermoplastics. When 2.5-mol% is exceeded, adhesion between rubber, thermoplastic elastomer, and thermoplastics becomes strong too much, and there is a possibility that distortion may arise depending on the case and a crack may go into thermoplastics.
[0033] Moreover, as the manufacture approach of the compound resin ingredient concerning this invention, although the following approaches are mentioned, thereby, it is not necessarily restricted.
(1) Be in the condition that thermoplastics, rubber, and/or thermoplastic elastomer were mixed, and the above-mentioned thermoplastics fused, and add organic-ized clay here.
(2) Make a solvent dissolve or distribute thermoplastics resin, rubber, and/or thermoplastic elastomer, add organic-ized clay to the obtained solution or dispersion liquid, and dry after that.
The resin composite material which organic-ized clay distributes to thermoplastics and is not distributing to rubber or thermoplastic elastomer by these approaches can be obtained. In addition, the distributed condition of the organic-ized clay in such resin composite material can be checked by transmission electron microscope observation.
[0034] Moreover, in the approach of the above (1), an efficient resin composite material is producible by using a biaxial extruder, for example. Moreover, although it is required to knead the temperature of kneading in a twin screw extruder in this case above the melting temperature of thermoplastics, it is still more desirable if rubber and thermoplastic elastomer are also in a melting condition. This is because

there is a possibility of viscosity becoming high too much and damaging equipment, if neither rubber nor thermoplastic elastomer is fusing.
[0035] Moreover, if thermoplastics, rubber, and thermoplastic elastomer are fusing, it is not necessary to raise temperature beyond the need. Thereby, degradation of the thermoplastics by heat, rubber, and thermoplastic elastomer can be prevented.
[0036]
[Embodiment of the Invention] The resin composite material concerning the example of an operation gestalt of example this invention of an operation gestalt is explained. The resin composite material concerning this example consists of polar thermoplastics, rubber and/or thermoplastic elastomer, and organic-ized clay, and the above-mentioned organic-ized clay is in the condition of having distributed to the above-mentioned thermoplastics.
[0037] The samples 1-5 which are the resin composite material concerning the example of such a book were produced, and the property was measured with the comparison sample. Samples 1-5 are explained below.
[0038] (Sample 1) As polar thermoplastics, the Pori (2, 6-dimethyl -1, 4-phenylene) ether (it abbreviates to PPE1 hereafter.) was prepared. Moreover, the styrene content prepared the 25-mol thing it is [thing] % (it abbreviates to an elastomer 1 hereafter.) with the copolymer of styrene and a butadiene as thermoplastic elastomer. Moreover, the sodium mold montmorillonite (Kunimine Industries trade name KUNIBIAF) was prepared, and what made this organic by the ion exchange by octadecyl ammonium was used as organic-ized clay (it abbreviates to organic-ized clay 1 hereafter.). Moreover, the biaxial extruder was prepared as a kneading machine which kneads these ingredients.
[0039] First, mixing and a dryblend object were obtained for PPE1 and an elastomer 1 at a rate (weight) of 7 to 3. To this dryblend object 100wt%, organic-ized clay 1 was mixed at a 3wt% rate, and mixture was obtained. This mixture was thrown in in the above-mentioned biaxial extruder, and it extruded by 5kg/hour in rate. Moreover, temperature inside the biaxial extruder at this time was made into 280 degrees C. Water cooling of the melting kneading object by which extrusion was carried out [above-mentioned] was carried out, and it was pelletized. This is the resin composite material concerning a sample 1.
[0040] (Sample 2) The addition of organic-ized clay 1 was made 5wt(s)%, and also resin composite material was produced like the sample 1. This is a sample 2.
[0041] (Sample 3) Resin composite material was produced like the sample 1 except having used what made the above-mentioned sodium mold montmorillonite organic with dodecyl ammonium (organic-ized clay 2) as organic-ized clay. This is a sample 3.
[0042] (Sample 4) As thermoplastics, the polystyrene which is compatible in PPE1 and this was prepared, it blended to 5 to 5 by the weight ratio, and the dryblend object was obtained. This dryblend object was mixed to 8 to 2 by the elastomer 1 and the weight ratio, and mixture was obtained. This mixture was thrown in from the feeder of the same biaxial extruder as the above, and organic-ized clay 1 was further supplied from the side feeder at a 3wt(s)% rate to the above-mentioned mixture 100wt%. Resin composite material was produced like the sample 1 except it. This is a sample 4.
[0043] (Sample 5) PPE1 and high impact polystyrene were prepared as thermoplastics. the above-mentioned impact nature polystyrene -- styrene-butadiene system rubber -- polystyrene 100wt% -- receiving -- 20wt(s)% -- it is added. Moreover, the content of the styrene in the above-mentioned styrene-butadiene system rubber is 14-mol%. In addition, if melting and kneading of are done, polystyrene will dissolve with PPE1, it does not dissolve but, as for PPE1 and high impact polystyrene, rubber presents island-like structure.
[0044] And the dryblend of the above PPE1 and the high impact polystyrene was carried out by the weight ratio 75 to 25. Organic-ized clay 1 was added like the sample 1 into the obtained mixture, melting and kneading of were done, and resin composite material was produced. This is a sample 5.
[0045] (Sample 6) As thermoplastic elastomer, the styrene content used the 40-mol thing it is [thing] % (elastomer 2) with the copolymer of styrene and a butadiene. Resin composite material was produced like the sample 1 except this. This is a sample 6.

[0046] (Sample 7) As thermoplastic elastomer, the styrene content used the 40-mol thing it is [thing] % (elastomer 2) with the copolymer of styrene and a butadiene. Resin composite material was produced like the sample 2 except this. This is a sample 7.
[0047] (Sample 8) Resin composite material was produced like the sample 3 except having used what was made organic with dodecyl ammonium (organic-ized clay 2) as organic-ized clay. This is a sample 8.
[0048] (Sample 9) As thermoplastic elastomer, resin composite material was produced like the sample 4 except having used the elastomer 2. This is a sample 9.
[0049] (Sample 10) The content of the styrene in the styrene-butadiene system rubber which constitutes impact nature polystyrene is 35-mol%. Resin composite material was produced like the sample 5 except it. This is a sample 10.
[0050] About the pellet with which samples 1-10 were obtained, it is the NISSEI PLASTIC INDUSTRIAL make. It injection molded by injection molding machine PS40EASE, and the test piece was fabricated. With this test piece, the tension test was performed according to ASTM638M, tensile strength, a modulus of elasticity in tension, and elongation were searched for, and it indicated to a table 1. Moreover, the produced test piece performed the Izod type impact test (those with a notch), stroke-proof nature was evaluated, and it indicated to a table 1. Moreover, the pellet of samples 1-10 was injected with the above-mentioned injection molding machine, spiral flow **** was performed, the flow nature of resin was investigated, and it indicated to a table 1. Moreover, the pellet of samples 1-10 was cut to the flake, the distributed condition of organic-ized clay was observed with the transmission electron microscope, and the result was indicated to a table 1.
[0051] According to the table 1, distributing organic-ized clay with the molecular level also in which sample was checked. However, about samples 1-5, distribution of the organic-ized clay to rubber and/or a thermoplastic-elastomer phase was not accepted, but was distributed only to the thermoplastics phase. On the other hand, distribution of organic-ized clay was mostly accepted [samples / 6-10] in thermoplastics and rubber, and/or a thermoplastic-elastomer phase similarly about which phase.
[0052] Rubber and/or the mixed ratio of thermoplastic elastomer were the same, and compared with thermoplastics the following combination from which the distributed condition of organic-ized clay differs, respectively. Combination is (a sample 1, a sample 6), (a sample 2 and a sample 7), (a sample 3 and a sample 8), (a sample 4 and a sample 9), and (a sample 5 and a sample 10) here.
[0053] Although tensile strength and an elastic modulus were equivalent when each compared, in elongation Izod impact value or a spiral flow trial value, it turned out that the composite material which is not distributed excels such composite material which organic-ized clay distributed also in rubber and/or an elastomer phase. Moreover, although the elongation of the sample 9 was the same as the sample 4, it turned out that Izod impact value and the trial value of spiral flow are excellent in the way of a sample 4. The sample 5 and the sample 10 were similarly found by that Izod impact value and the trial value of spiral flow are excellent in the way of a sample 5.
[0054] As mentioned above, although the sheet with which almost all organic-ized clay constitutes this comes apart and the resin composite material concerning this example is distributed to thermoplastics, each sheet has played the role which restrains the molecule of thermoplastics at this time. Therefore, the resin composite material concerning this example turns into an ingredient excellent in mechanical properties, such as high tensile strength and a high modulus of elasticity in tension.
[0055] And the above-mentioned clay is hardly distributed to rubber or thermoplastic elastomer. Therefore, flexibility and resiliency will be given to the resin composite material concerning this invention focusing on a rubber and thermoplastic elastomer's existence part, and it turns into an ingredient excellent in shock resistance. Moreover, since the parts of the above-mentioned rubber or thermoplastic elastomer give a fluidity to resin composite material when resin composite material becomes soft with heating etc., at the time of shaping, resin can spread to all the corners of a mold. Therefore, it is the ingredient excellent in the moldability.
[0056] As mentioned above, according to this example, the resin composite material which is excellent also about shock resistance or a moldability with a mechanical property can be offered.

[0057]
[A table 1]
(表1)

	引張強度 (MPa)	引張弾性率 (MPa)	伸び (%)	アイゾット衝撃値 (J/m)	スパイラルフロー試験 (cm)	有機化クレイの分散状態 (*)
試料1	57.8	1260	68	100	60	○
試料2	65.3	1420	65	70	40	○
試料3	56.2	1270	70	90	50	○
試料4	60	1200	50	60	60	○
試料5	58	1100	80	110	50	○
試料6	56	1250	15	18	12	×
試料7	63.4	1430	5	5	3	×
試料8	55.2	1260	10	20	10	×
試料9	60	1180	50	10	15	×
試料10	58	1100	80	80	20	×

(*) ○. . . 熱可塑性樹脂相のみに有機化クレイが分散している。
×. . . 熱可塑性樹脂相以外のゴム及び／または熱可塑性エラストマ相にも有機化クレイが分散している。

[0058]
[Effect of the Invention] According to this invention, like ****, the resin composite material which is excellent also about shock resistance or a moldability with a mechanical property can be offered.

[Translation done.]